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HIGHWAY AND TRANSPORTATION ENGINEERS

GCA



Flood Risk Assessment

Forest Hill Golf Club

**Markfield Lane
Botcheston
Leicester
LE9 9FH**

For

Forest Hill Golf Club

Ref: 1/8286/D

June 2022



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Document Control

Project: Forest Hill Golf Club, Leicester

Document Title: Flood Risk Assessment

Our Ref: 1/8286/C

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Date May 2022

RECORD OF AMENDMENTS TO DOCUMENT

Ref	Description	Date
A	Flood Risk Assessment Submitted	31 st July 2020
B	Minor Amendment – Client review	5 th August 2020
C	Documents updated following changes to the Hotel Layout	May 2022
D	Appendix B revised to show revised site plan	June 2022

Executive Summary

SITE INFORMATION	Client	Forest Hill Golf Club
	Site	Forest Hill Golf Club
	Site Location	The development site is located within the existing Forest Hill Golf Club site, off Markfield Lane, Botcheston, Leicester, LE9 9FH
	Current Land Use	Existing Forest Hill Golf & Conference Centre, including restaurant & bar, conference facilities and golf club amenities.
	Proposed Development	Site extension including a 98 rooms hotel with swimming pool and spa facilities, with associated car parking and external works.
GENERAL FLOOD RISK INFORMATION	Flood Zone	Based on environment Agency Flood Mapping the site lies in Flood Zone 1 (FZ1) – land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).
	Ground water	Risk of ground water flooding is considered to be very low.
	Surface Water	Based upon the latest Surface Water Flood Risk Mapping issued by the Government, the site is designated to be at low risk from surface water flooding. A minor band of pluvial risk within the site has been identified, although this will be removed as a result of the development. Surface water is collected in gullies and conveyed to the local public sewer.
	Soakaways	Soakaways are not used on the existing site.
	Impact of Development	The development does not result in a displacement of fluvial flood plain or increase flood risk elsewhere.

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1. **INTRODUCTION**

- 1.1. GCA (UK) Ltd. (GCA) has been commissioned by Forest Hill Golf Club to undertake a Flood Risk Assessment to support an outline planning application for a proposed Hotel & Spa development at the existing Forest Hill Golf Club, Leicester, LE9 9FH.
- 1.2. A site location plan is provided in **Appendix A**.
- 1.3. This assessment has been undertaken to ascertain the constraints of the development to the site, and to assess the impact of the change of use, with respect to flooding and impact of the proposed drainage.
- 1.4. This assessment has been prepared using our best engineering judgement but there are levels of uncertainty implicit in the historical data and methods of analysis. The report is based on the following information:
 - British Geological Survey Mapping
 - Flood Zone Maps from the Environment Agency and Government websites
 - EA Flood Risk Data
 - Topographical Data
 - Severn Trent Water Asset Mapping
 - Leicestershire & Leicester City SFRA (Strategic Flood Risk Assessment) Levels 1 (2017)
- 1.5. All comments and opinions contained in this report, including any conclusions are based on the information available to GCA at the time of writing this report. The conclusions drawn by GCA could therefore differ if the information is found to be inaccurate, incomplete or misleading. GCA accepts no liability should this prove to be the case, or, if additional information exists or becomes available with respect to this site.
- 1.6. GCA has completed this report for the benefit of the organisations/individuals referred to in the “Introduction” section; and any relevant Statutory Authority which may require reference in relation to approvals for the proposed redevelopment of the site. Other third parties should not use or rely upon the contents of the report unless written approval has been gained from GCA.
- 1.7. GCA accepts no responsibility or liability for:
 - The consequences of this documentation being used for any purpose or project other than that for which it was commissioned, and
 - This documentation to any third party with whom approval for use had not been agreed.

2. SITE DESCRIPTION

Site Location and Features

- 2.1. The existing site is located approximately ten miles north west of Leicester, adjacent to the Markfield Lane. The site is located at Grid Reference 448045 (Easting), 306410 (Northing), Botcheston, LE9 9FH.



Figure 1: Site Location Plan

- 2.2. The site boundary is shown in Figure 1 above. The site extents shown encompass the existing Golf Club & Conference building and associated car parking facilities to the north, and the proposed Hotel & Spa development to the south.
- 2.3. The site is bound by Markfield Lane to the west, greenfield land to the north & south, and the associated golf course to the east. The immediate local area is predominantly greenfield land.
- 2.4. Topographical data indicates that the existing ground levels range from approximately 132.0mAOD within the northern extents (existing Golf Club & Conference Centre), to 128.0mAOD in the southern extents.
- 2.5. The external arrangement is to remain as per the existing layout, with the minor addition of additional plant facilities. The site location is shown below with the proposed layout in **Appendix**

3. **FLOOD RISK TO SITE**

Flood Zone Maps & Flood Defence Data

- 3.1. According to the latest Flood Zone Mapping issued by the Environment Agency, the entire site lies within Flood Zone 1 (FZ1).
- 3.2. Flood Zone 3 (FZ1) is classed as; 'land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%)'.
- 3.3. Figure 2 below shows an extract of the current Flood Zone website map:

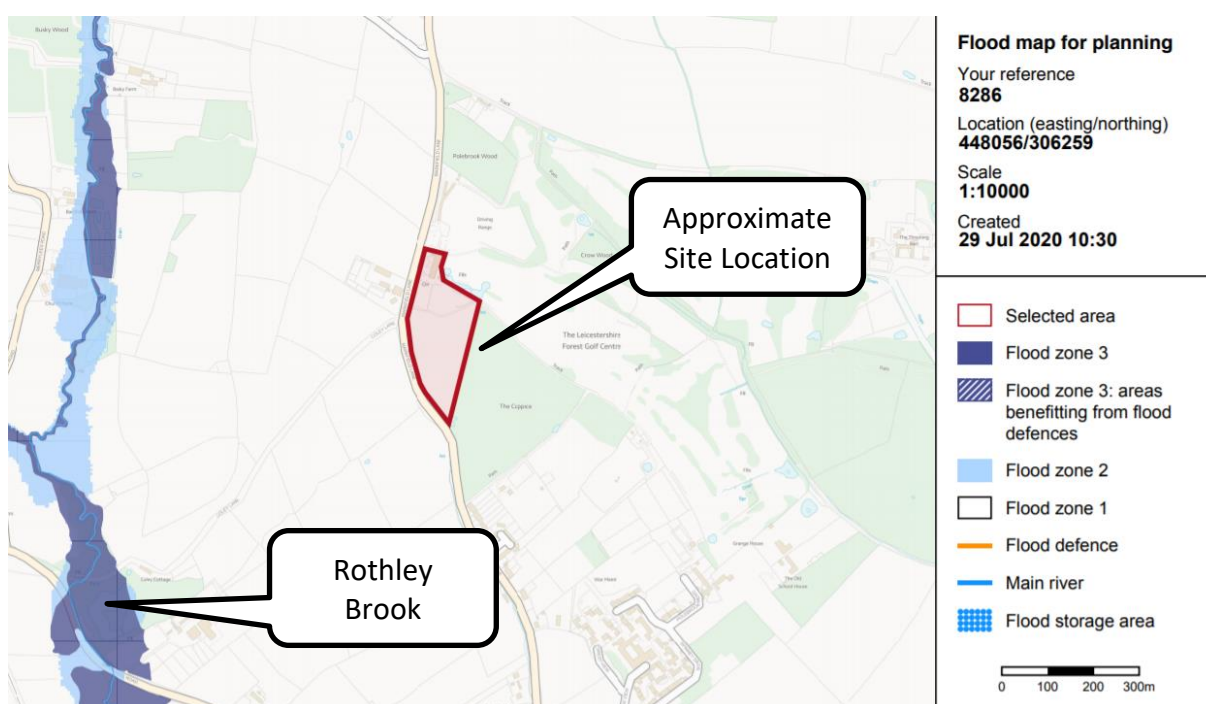


Figure 2: Environment Agency Flood Mapping

Watercourse & Hydrology

- 3.4. The site lies approximately 720m west of the Rothley Brook, an EA designated Main River watercourse.
- 3.5. The Rothley Brook has associated extents of Flood Zones 2 & 3, which are confined to the immediate channel area, as well as surrounding low-lying areas. Therefore, due to the intervening distance and topography, the Rothley Brook does not pose a Flood Risk to the site.

-
- 3.6. The Leicestershire & Leicester City SFRA includes supporting Flood Risk Mapping for the site area, which is included for reference as **Appendix C**. This mapping indicates that a minor (unnamed) watercourse (part of the mapped 'Detailed River Network') is present to the eastern site boundary.
- 3.7. This watercourse acts as a drainage ditch, as observed during a site visit.
- 3.8. Topographical data (and LCC SFRA Mapping) indicates that the drainage ditch flows south along its alignment on Markfield Lane, before discharging to the Rothley Brook at a location approximately 1.8km south of the site off Desford Lane.
- 3.9. The SFRA mapping indicates that there are no Flood Zones (therefore, no fluvial risk) associated with the drainage ditch. The Flood Risk posed to the site is therefore considered to be consistent with the identified pluvial risk extents, which is to be outlined within the Surface Water Flood Risk section.
- 3.10. The SFRA also includes Fluvial Flood Risk extents for future climate change events within the 2080s epoch. The site remains well removed within the 1% AEP Climate Change, including Lower, Central & Upper allowances.

Historic Flooding

- 3.11. The LCC SFRA holds historical flooding records, however there are no recorded incidents within close proximity to the site.

Surface Water (Pluvial) Flood Risk

- 3.12. Within the site boundary, minor areas of low and medium surface water flood risk are present, according to the Environment Agency "Risk of Flooding from Surface Water" maps (see **Figure 3** below). Low Risk is classed as an area that has a chance of flooding between 0.1% and 1% (annual probability) and medium risk classed as between 1% and 3.3% annual probability. The majority of the site is at very low flood risk.

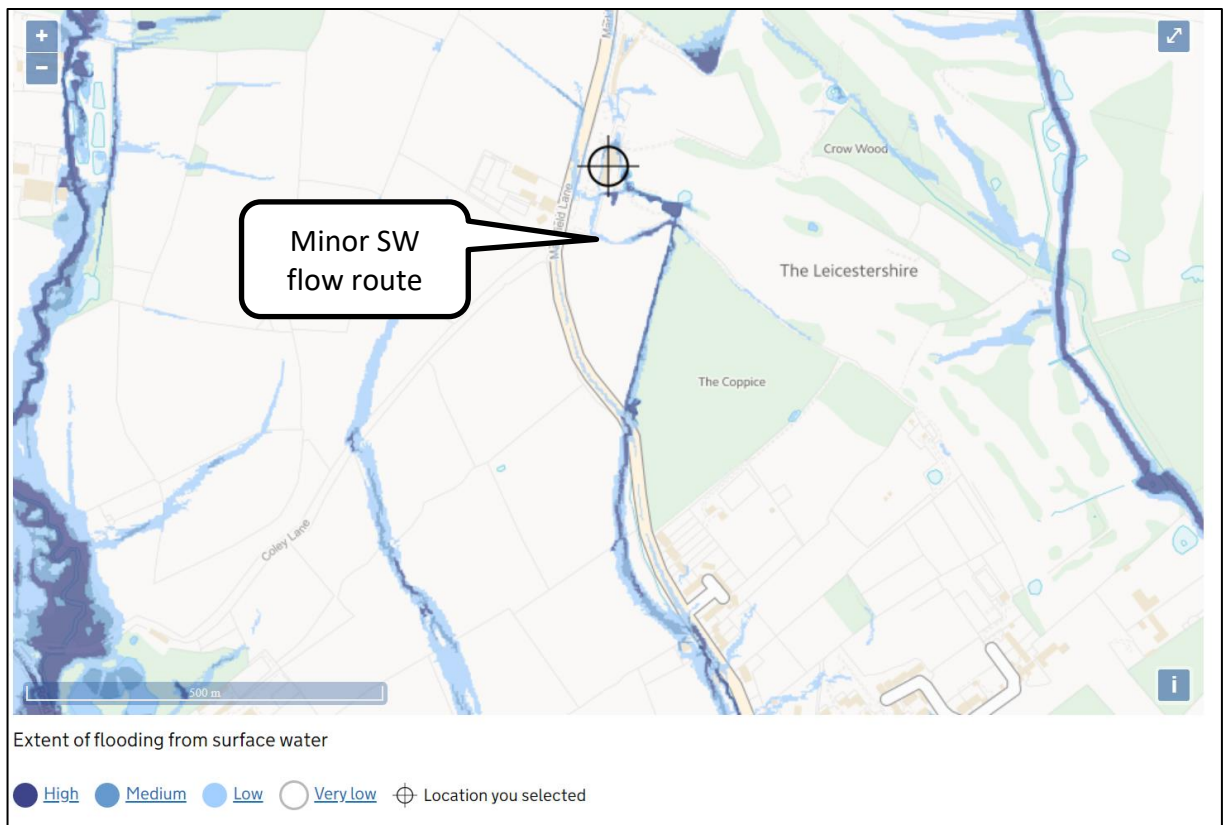


Figure 3: Risk of Flooding from Surface Water Plan

- 3.13. The majority of the risk shown is associated with the topography of drainage ditch, which will continue to act as a conduit for surface water under extreme conditions. However, a band of pluvial risk (medium & low) is shown outside of the ditch channel (at a location to the south of the existing clubhouse area).
- 3.14. The area of pluvial flood risk is linear in nature, and consistent with the location of an informal vehicle track which is present to the south of the existing.
- 3.15. There is a minor extent of upstream connectivity to the potential pluvial flow route, which is located to the west of Markfield Lane, north of the site. A further pluvial flow route is located to the rear of the clubhouse building (associated with the alignment of the pond network and footpaths). This flow route will be maintained post-development; therefore, the upstream connectivity is maintained and flood risk will not be increased as a result of the development.
- 3.16. Overall, the risk of flooding from pluvial sources is considered to be low. The external proposals are as such that the identified flood risk (minor flow route) will be removed, whilst the minor upstream connectivity will be retained.

Other Flooding Risk and other Allocation

- 3.17. Geological maps indicate that the site is underlain by a bedrock geology of Edwalton Member - Mudstone, with superficial deposits of Oadby Member - Diamicton. Strata within the mudstone group generally has low permeability for the movement of groundwater, minimising the flood risk to this part of the site from this source. Furthermore, the LCC SFRA indicates that the site is located within an area at <25% susceptibility to groundwater flooding (very low risk).
- 3.18. The proposed development does not fall under an area that is exposed to flood risk from reservoirs.
- 3.19. The site is not within a Groundwater Source Protection Zone, as designated by the Environment Agency.
- 3.20. There are no public sewers located within the site, as confirmed by Severn Trent Water (asset plans included for reference as **Appendix D**).

Source	Potential Flood Risk to Site			
	High	Medium	Low	No
Fluvial				✓
Ordinary Watercourse			✓	
Tidal				✓
Infrastructure Failure			✓	
Pluvial			✓	
Reservoir				✓
Artificial drainage systems			✓	
Groundwater			✓	

Table 1: A Summary Table of the Flood Risks to the Site

Vulnerability Classification of Proposed Development

- 3.21. Table 2 of the Planning Policy Guidance Flood Risk and Coastal Change to the National Planning Policy Framework (PPG-FRCC) provides information on the Vulnerability Classification of various developments. The proposed end use of this site is in the “more vulnerable” classification of the Table. Table 3 in PPG-FRCC details compatibility of the end use with different Flood Zone classifications.
- 3.22. Comparison of More Vulnerable use with the proposals within FZ1 areas shows that the “Development is Appropriate”.

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

Key: ✓ Development is appropriate.
 × Development should not be permitted.

Notes to table 3:

This table does not show:

- the application of the Sequential Test which guides development to Flood Zone 1 first, then Zone 2, and then Zone 3;
- flood risk assessment requirements; or
- the policy aims for each flood zone.

Table 2: Flood risk vulnerability and flood zone ‘compatibility’

Sequential Test

- 3.23. According to PPG-FRCC, the sequential test gives preference to locating new development in Flood Zone 1 (FZ1 – Least risk of flooding).
- 3.24. In line with PPG-FRCC, the Sequential Test will not be required as the development is located within Flood Zone 1.

Exception Test

- 3.25. In line with PPG-FRCC, the Exception Test will not be required as the development is located entirely within Flood Zone 1.

4. **CONCLUSION AND SUMMARY**

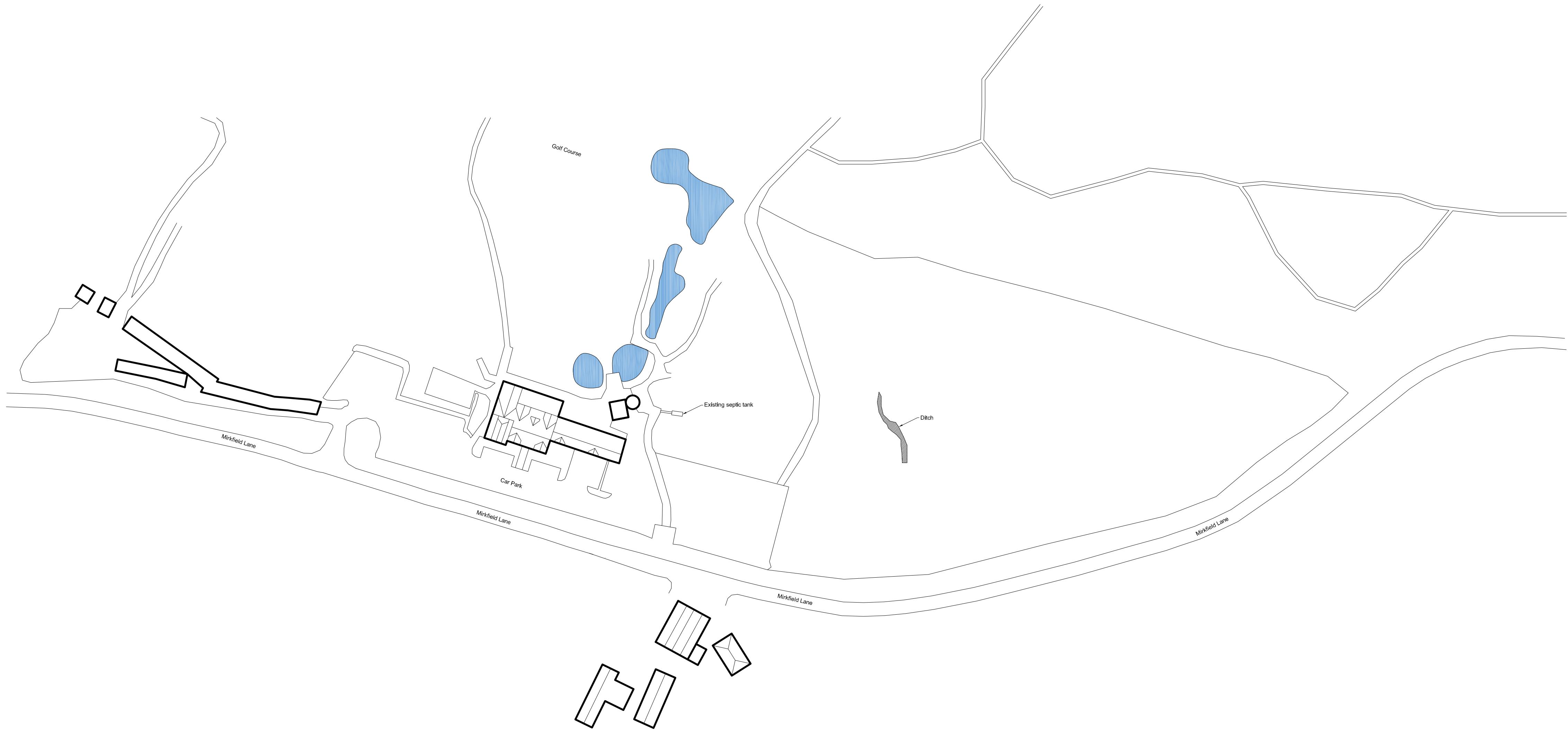
4.1 GCA (UK) Ltd. (GCA) has been commissioned by the Forest Hill Golf Club to undertake a Flood Risk Assessment to support a planning application for a proposed Hotel & Spa development at the existing Forest Hill Golf Club, Leicester, LE9 9FH. Key points are outlined below:

- The site lies within Flood Zone 1 which has a low probability of annual flooding.
- According to PPG-FRCC, no Exception Test or Sequential Test is required for the proposed development.
- A minor pluvial flow route has been identified, which will be removed as part of the development proposals. This will not increase flood risk, as the minor upstream connectivity is maintained via alternative existing flow routes.
- Overall, the site is considered to be at low risk from surface water flooding.
- The nature and extents of the redevelopment does not increase flood risk elsewhere or result in a displacement of functional floodplain.

4.2 The proposed development does not create any flood risk issues to the wider area.

Appendix A

Site Location Plan



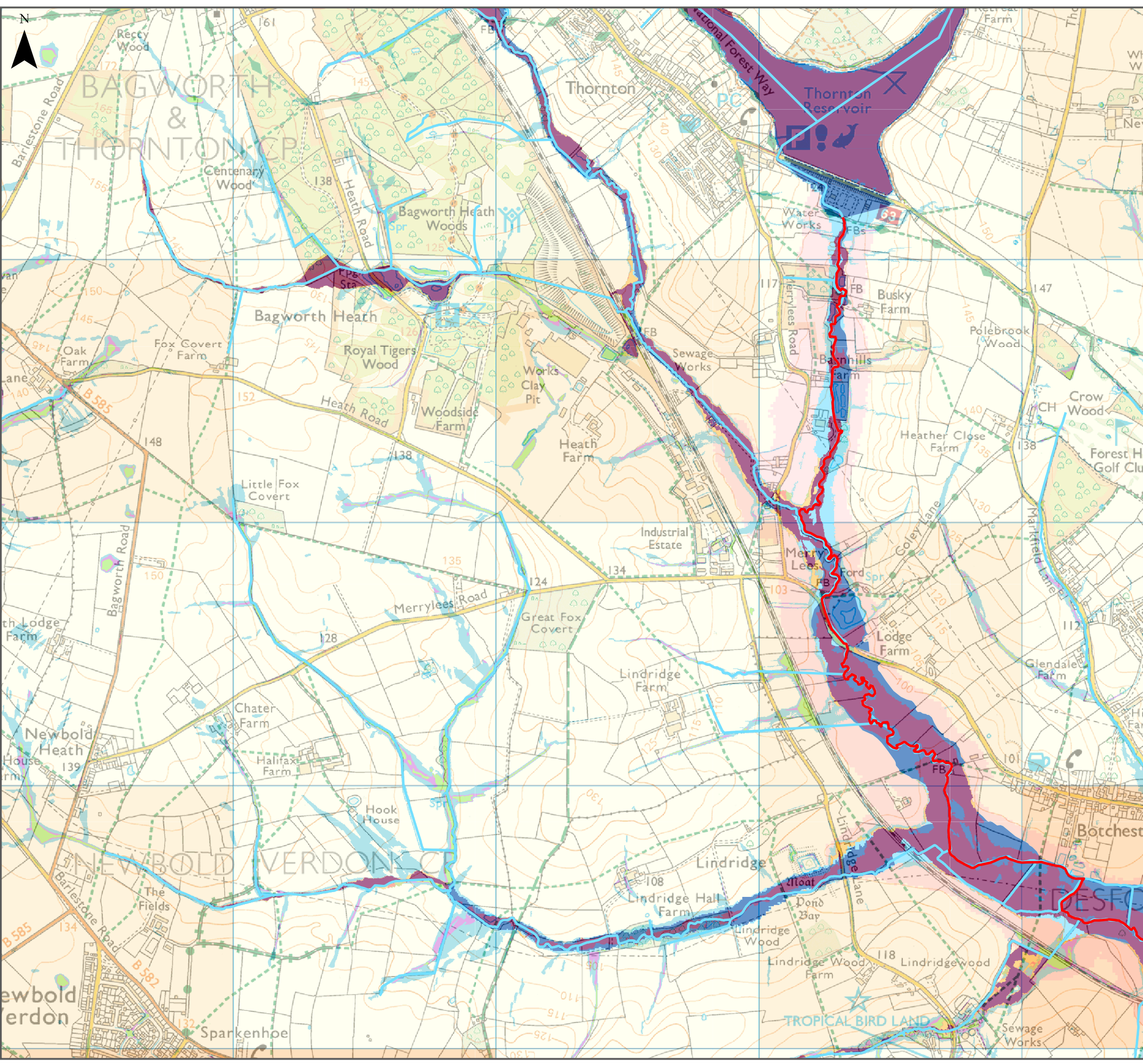
All Dimensions in Millimetres unless stated otherwise. Do not scale Dimensions from this drawing

HEALTH & SAFETY INFORMATION	
IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING	
<u>CONSTRUCTION</u>	
1.	Verify/divert all services (gas, heating pipes, water, etc)
<u>MAINTENANCE/CLEANING/OPERATION</u>	
1.	N/A
<u>DECOMMISSIONING/DEMOLITION</u>	
1.	N/A
NOT FOR CONSTRUCTION UNLESS STATED BELOW	
<u>NOTES</u>	
1.	All works to be undertaken in accordance with the Building Regulations and good building practice.
2.	Do not scale from this drawing.

Rev	Date	Revised Details	Rev by	Approved
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		Checked	MG	19.11.19
		Approved	MG	19.11.19
client		Starsis Leisure Ltd		
project		Forest Hill Golf Club		
title		Layout Plan		
Dwg No		01		
Project No		8286	Scale	Not To Scale
Preliminary		☒ Detailed	☐ Tender	☐ Construction
		☐ As Built		

Appendix C

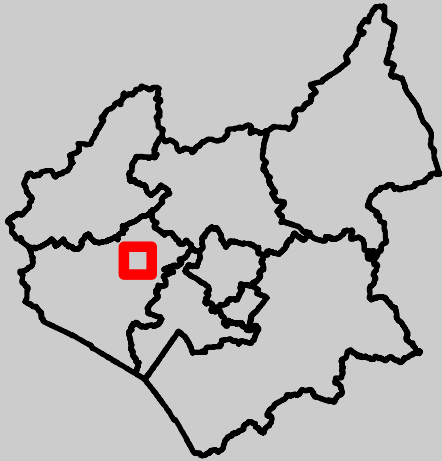
Leicestershire & Leicester City SFRA Mapping



STRATEGIC FLOOD RISK ASSESSMENT
LEVEL 1

APPENDIX A: FLOOD RISK MAPPING

INDEX GRID: 75



LEGEND

Authority Information

- ☒ Study boundary
- ☒ Main Rivers
- ☒ Detailed River Network

Climate Change (2080s)

- ☒ 1% AEP Climate Change Lower
- ☒ 1% AEP Climate Change Central
- ☒ 1% AEP Climate Change Upper

Flood Zones

- ☒ Flood Zones 3b
- ☒ Flood Zones 3a
- ☒ Flood Zones 2

Areas Susceptible to Groundwater Flooding

- ☒ >= 75%
- >= 50% <75%
- >= 25% <50%
- < 25%

Surface Water

- ☐ RoFfSW 3.3% AEP
- ☐ RoFfSW 1% AEP
- ☐ RoFfSW 0.1 AEP

Reservoir Inundation

- ☒ Reservoir Inundation

Mapping Supporting Information

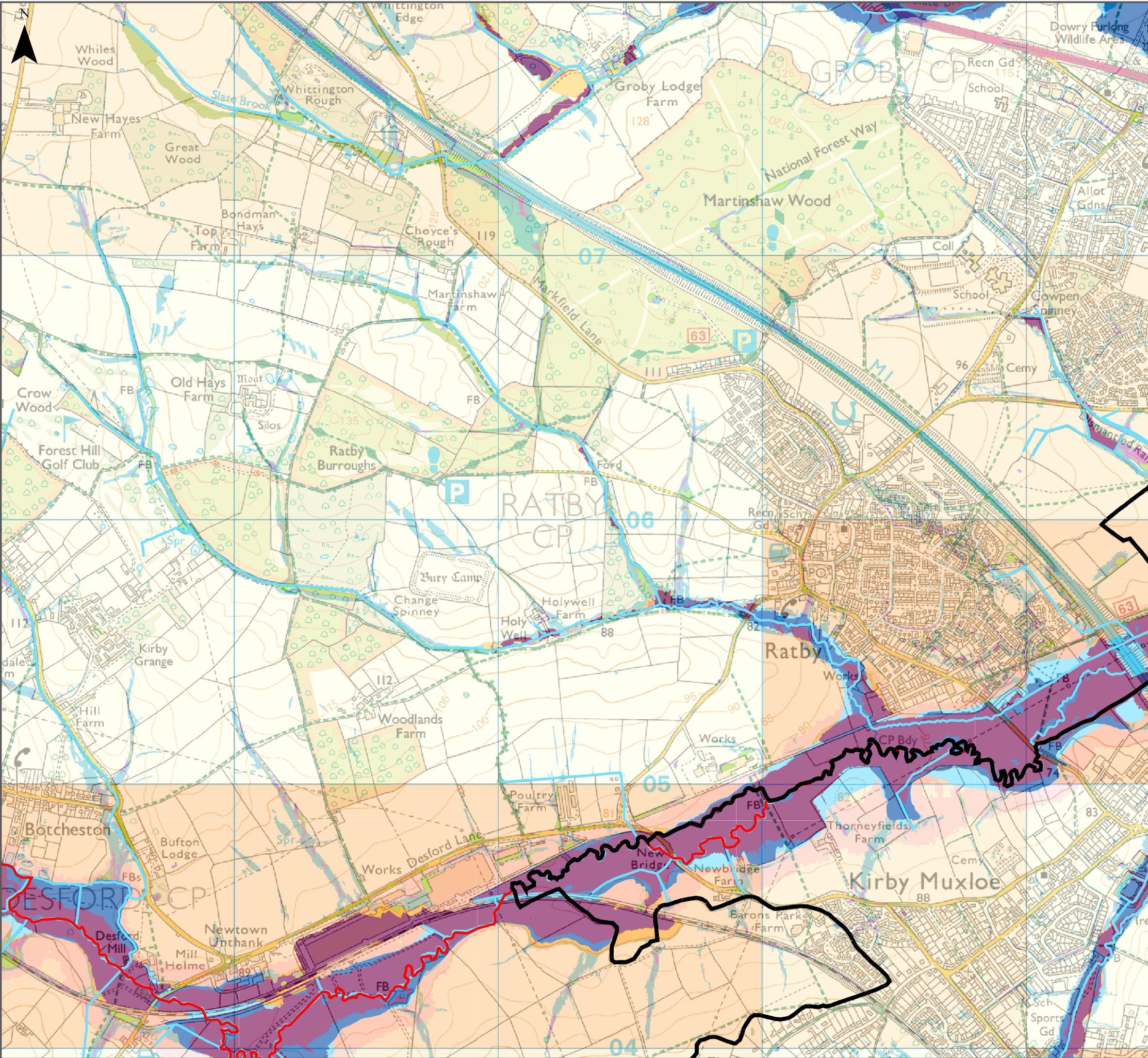
Return to Index Map



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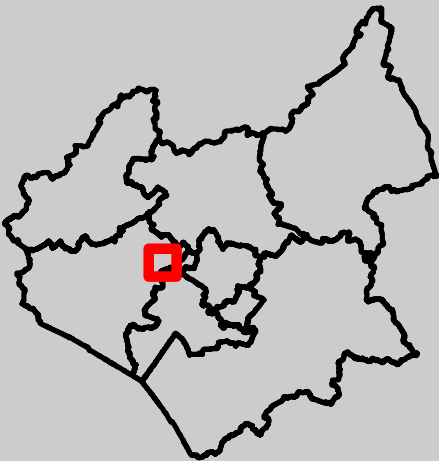
JBA
consulting



STRATEGIC FLOOD RISK ASSESSMENT
LEVEL 1

APPENDIX A: FLOOD RISK MAPPING

INDEX GRID: 76



LEGEND

Authority Information

- Study boundary
- Main Rivers
- Detailed River Network

Climate Change (2080s)

- 1% AEP Climate Change Lower
- 1% AEP Climate Change Central
- 1% AEP Climate Change Upper

Flood Zones

- Flood Zones 3b
- Flood Zones 3a
- Flood Zones 2

Areas Susceptible to Groundwater Flooding

- $\geq 75\%$
- $\geq 50\% < 75\%$
- $\geq 25\% < 50\%$
- $< 25\%$

Surface Water

- RoFfSW 3.3% AEP
- RoFfSW 1% AEP
- RoFfSW 0.1 AEP

Reservoir Inundation

- Reservoir Inundation

Mapping Supporting Information

Return to Index Map



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